Abstract

In this talk we give a brief overview of the field of synthetic biology and particularly focus on the question how methods from systems and control theory can aid in the design of novel biological systems. One of the main goals of synthetic biology is the de-novo design of biological parts that realize precisely defined functions. The functional scope of such systems has so far been limited to sensors and actuators. From a control engineer’s point of view, it is natural to extend the functional range to more complex dynamical systems such as controllers or optimizers in order to be able to realize more complex functions with high accuracy and certain robustness properties. In view of the complexity and size of biological systems, the distinctive systematics of known design methods can play a key role in advancing the field of synthetic biology. While control theory provides such methods for the design of controllers, their implementation in a biological context poses numerous challenges due to the partially unknown mechanisms and the nonlinearity of the dynamics.

Biographical Information

Wolfgang Halter received his diploma degree (Dipl.-Ing.) in Engineering Cybernetics from the University of Stuttgart in 2013. During his undergraduate studies he was a fellow of the Studienstiftung des Deutschen Volkes, spent 2 months at the Economic Department of the German Embassy in London, 6 months at the Whole Engine Mechanics Group of Rolls-Royce Germany, Berlin, and 9 months at Merrimack Pharmaceuticals in Cambridge, MA, USA. Since 2014 he is a research and teaching assistant at the Institute for Systems Theory and Automatic Control in Stuttgart where he focuses on bridging the fields of control theory and synthetic biology. In 2017, he spent 3 months as a visiting researcher at the California Institute of Technology.